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ABSTRACT

Characteristics that might help predict student prominence within a medical school class were studied. The prominent student is one who is highly visible and extensively involved in key relationships with other students. This prominence is expected to provide the student with greater access to information and resources held by classmates. A total of 48 first-year students enrolled in a medical neurobiology course completed a Survey of Social Networks, and indicated the amount of time they had spent, per week, studying with each of their peer contacts. Results indicate that prestigious students were those who were actively sought out by peers for advice and other support. These individuals might be thought of as powerful figures within the medical school class. The students who were most "powerful" within the network tended to be more introverted and more academically successful. Highly central figures were characterized by extensive direct connections to and from other class members, thus making them both seekers of information and objects of information searches. The picture of the central student is one of a more gregarious, interactive person than the highly prestigious member. Class members with the highest degree of connectivity had less background hours in the sciences and admitted to being very anxious about their medical school experience. (SW)

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PREDICTING PROMINENCE WITHIN A MEDICAL SCHOOL CLASS: A SOCIAL NETWORK ANALYSIS

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INTRODUCTION

Within the last ten years medical educators have become increasingly sensitive to the existence of a global climate for learning that exists within medical school and the effects of that climate on the medical education process. Researchers have referred to this generalized climate for learning as the "medical school learning environment," although a consenual definition for this term has not emerged (1). Studies of the medical school learning environment have been primarily evaluative in nature, focusing on such problems as discrepancies between faculty and student perceptions (2), student concerns about the medical school curriculum (3), the existence of specific stressors within medical school (4), and the relationship between perceptions of the learning environment and academic performance (5).

One of the most frequently cited dimensions of the medical school learning environment is what has been called the student interaction dimension. This dimension has been characterized as the quantity and quality of interaction between students within the medical school environment. Student-to-student interaction is considered to be an extremely important mechanism through which ideas and information are diffused within the medical school. Unfortunately, the method of measuring this interactional dimension has typically consisted of a series of lickert-type statements to which students either agree or disagree (6,7). The result of this measurement procedure is typically a single summary score, representing a students' generalized perception of the quantity of student-to-student interchange.

While the summated rating method of measuring student interaction may give a rough estimate of the quantity of overall student interaction within the medical school environment, its utility is very limited in studying the interpersonal dynamics of the medical school. Specifically, this common approach for measuring student-to-student interaction has contributed very

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little to our understanding of the informal social structure existing within the medical school environment and the effect that such a structure has upon the flow of information among medical students. However, the presence of an informal social organization and communication network within the medical school can serve as a critical means of disseminating new information and providing access to social resources within the medical school environment. Of particular importance are those students who are prominent within the medical school; i.e. those who are highly visible and are extensively involved in key relationships with other students (8). Whether engaged in study, committee assignments, or social events, the prominent student is expected to have greater access to information and resources held by classmates. These highly visible students also possess certain valued qualitites that other network members attach to that position (9).

In a number of different contexts, network prominence has been shown to be associated with certain highly valued characteristics such as personal innovativeness (10) and academic success (11). Unfortunately, there has been a lack of research into the structure of informal medical school networks. In particular, very little is known about the characteristics of individuals who occupy positions of prominence with the medical school class.

Given the critical role played by prominent class members in shaping the medical school learning environment through such things as academic role modeling or committee representation, there was a need to determine the qualities that are associated with positions of prominence. The research question addressed in this study was: Could student prominence within a medical school class be predicted from academic and psychological characteristics and if so, what characteristics were most useful in making this prediction?

METHODOLOGY

During the 1983 spring semester, first year students enrolled in Medical Neurobiology (N=54) were asked to complete a Survey of Social Networks, in which they identified peers with whom they had spent time learning or studying about neurobiology, outside of scheduled class sessions.[1] Students also indicated the amount of time they had spent, per week, studying with each of their peer contacts.

The interpersonal contacts identified by the 48 students who responded were entered into a binary adjacency matrix. The students arrayed in the rows of the matrix represented initiators

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[1]A copy of the Survey of Social Networks can be obtained from the first author.

of the interpersonal contact, while those listed across the columns were recipients of the contacts. The elements in the adjacency matrix indicated either the presence or absence of a linkage, where a (1) represented a linkage and a (0) represented the absence of a linkage. The variable Zij represented the relationship (or lack of relationship) from the i^{th} student to the j^{th} student. Since the matrix was square, the diagonal (Zii) elements represented self-linkages and hence were given a value of zero.

Once the binary adjacency matrix was established, three measures of network prominence were calculated for each student, as outlined in Knoke and Kuklinski (12). First, a measure of connectivity was calculated by squaring the adjacency matrix, summing all possible direct and one-step indirect links to and from other students, and expressing this sum as a proportion of the possible number of such linkages. Connectivity expresses a tendency to be in contact with a large number of one's peers, either directly or indirectly through an intervening contact.

Second, a measure of centrality was calculated for each student, based on the actual number of direct connections to and from one's peers. The measure was obtained by summing the non-redundant linkages found in both the row and column for a given individual. This was expressed as a proportion of the total direct connections possible.

Third, prestige was expressed as the ratio of all direct linkages directed toward the individual by other students, to the total number of such linkages that were possible.

The independent academic variables used in the analysis were obtained from student records and included the following: number of undergraduate science hours, undergraduate science grade point average (GPA), average score on Medical College Admission Test (MCAT), first semester medical school GPA, Medical Gross Anatomy grade (fall semester), and mid-term test score in Medical Neurobiology. Independent psychological variables were the 14 subscales of the Omnibus Personality Inventory (13) and four scale scores from the Myers-Briggs Type Indicater (14). Each of the three measures of prominence was entered as the dependent variable in a stepwise multiple regression analysis to determine which of the independent variable were most closely associated with prominence. The C_p statistic (15), was used as the criterion upon which the "best" model was selected. Using this criterion, the obtained model yielded the least biased parameter estimates.

RESULTS

Initially, pearson-product moment correlations were established between the three measures of network prominence to determine if distinctions could be made between one's level of

prestige, centrality and connectivity. The results of this analysis are given in Table 1.

TABLE 1. PEARSON-PRODUCT MOVEMENT CORRELATIONS BETWEEN MEASURES OF MEDICAL STUDENT PRESTIGE, CENTRALITY, AND CONNECTIVITY.

	Prestige	Centrality
Prestige		
Centrality	.71*	
Connectivity	.07	-.02

*Statistically significant at $\alpha = .05$
n=53 for all correlations

The results indicate that there was a relationship between one's level of prestige and centrality. This was expected since the level of prestige was incorporated into the measure of centrality, producing an autocorrelation between the two measures.

However, the association indicated that there was not a perfect correspondence between the two measures, and suggested that a position of prestige may indeed be qualitatively different from a position of centrality. Connectivity showed very little relationship to either prestige (r=.07) or centrality (r=-.02). Those students without extensive indirect connections to classmates did not appear to necessarily be either prestigious or central.

The mean scores on the three measures of prominence are given in Table 2.

TABLE 2. MEAN SCORES AND STANDARD DEVIATIONS ON MEASURES OF PRESTIGE, CENTRALITY AND CONNECTIVITY FOR THE CLASS OF FRESHMAN MEDICAL STUDENTS.

Variable	n	Mean	SD
Prestige	48	.07	.04
Centrality	48	.09	.05
Connectivity	48	.28	.18

These results show that the average prestige value was .07, meaning that the typical student was sought out by 7% of his or her classmates. This typical student had direct connections (both incoming and outgoing) with 9% of his/her classmates. Interestingly, the typical student was connected both indirectly and directly to 28% of the responding classmates.

Regressing prestige level upon the independent variables yielded a best fitting three variable model which explained thirty-two percent (R^2=.32) of the variability in the dependent variable. (See Table 3) The most prestigious students were those who had obtained the highest total scores on the Medical Neurobiology mid-term test and had higher science GPAs as undergraduate students. The most prestigious students were more socially introverted than extroverted, preferring to avoid social gatherings and to study and work individually.

TABLE 3

SUMMARY TABLE OF STEPWISE MULTIPLE REGRESSION ANALYSIS WITH PRESTIGE AS THE DEPENDENT VARIABLE

Predictor Variable	F-Level	Significance (p)	Incremental Multiple R	Incremental R^2
Neurobiology Mid-Term Exam	11.80	.01	.48	.23
Undergraduate Science GPA	2.65	.11	.53	.28
Social Extroversion	1.49	.23	.57	.32
Overall F = 6.57	Significance (p) = .01			α = .05

When centrality was regressed upon the independent variables, a best fitting three variable model was obtained which explained twenty-four percent of the variation in (R^2=.24). (See Table 4) Central figures in the information network were those with high scores on the Medical Neurobiology mid-term test. These students reported a strong sense of commitment to Judeo-Christian beliefs, and expressed having a conservative orientation. Highly central students also tended to have stronger social and esthetic inclinations and admitted to being sensitive and emotional.

TABLE 4

SUMMARY TABLE OF STEPWISE MULTIPLE REGRESSION ANALYSIS WITH CENTRALITY AS THE DEPENDENT VARIABLE

Predictor Variable	F-Level	Significance (p)	Incremental Multiple R	Incremental R^2
Neurobiology Mid-Term Exam	11.59	.01	.36	.13
Religious Orientation	3.78	.06	.44	.19
Masculinity-Femininity	3.10	.09	.49	.24
Overall F = 4.71	Significance (p) = .01		α = .05	

When connectivity was regressed upon the independent variables, a best fitting three variable model was obtained which explained sixteen percent (R^2=.16) of the variance. (See Table 5) Students with high levels of connectivity had taken fewer hours to science at the undergraduate level, reported being highly sensitive, admitted to worrying about things, and often felt that situations were piling up on them.

TABLE 5

SUMMARY TABLE OF STEPWISE MULTIPLE REGRESSION ANALYSIS WITH CONNECTIVITY AS THE DEPENDENT VARIABLE

Predictor Variable	F-Level	Significance (p)	Incremental Multiple R	Incremental R^2
Undergraduate Science Hours	3.70	.06	.30	.09
Anxiety Level	5.59	.02	.40	.16
Overall F = 4.36	Significance (p) = .02		α = .05	

DISCUSSION

The results of this study suggest that medical students who hold prominent positions have identifiable characteristics that set them apart from their classmates. However, these characteristics are dependent upon one's definition of "prominence". Prestigious members were those who were actively sought out by their peers members for advice, consultation, etc. These might be though of as powerful figures within the medical school class. Those individuals who were most "powerful" in the network tended to be more introverted and were the most successful "students," in an academic sense.

Highly central figures were characterized by extensive direct connections to and from other class members, thus making them both seekers of information and objects of information searches. Centrality was more difficult to explain that prestige (R^2=.24 to R^2=.32) due to the many different factors that could influence one's decision to give or receive information. These students were characterized as having had success on the course mid-term exam, were more social in nature and tended to be conservative, sensitive and emotional. The picture of the central student is one of a more gregarious, interactive person than the highly prestigious member.

Class members with the highest degree of connectivity exhibited a somewhat different profile. These students had less background hours in the sciences and admitted to being very anxious about their medical school experience. Perhaps a high degree of connectivity was a mechanism used by these students to gain access to many of the resources in the class, thus reducing some of the anxious feelings and adding a degree of certainty to their medical school experience.

CONCLUSIONS AND IMPLICATIONS

These findings point to the fact that prominence in medical school is a consequence of many complex factors. Clearly, being a highly visible individual within a medical school class is not the same as occupying a position of prestige. Individuals who fill different positions exhibit characteristics unique to those positions. Understanding the characteristics of those holding positions of prestige, centrality and connectivity within the medical school environment will enable medical educators to more effectively communicate information to those individuals who are key in the information network, thus allowing information to be diffused efficiently throughout the medical school.

One very important application of these findings could be in the selection of student representatives to college of medicine committees or task forces, where certain students would be more effective that others, depending on the nature of the committee assignment. In addition, this information will be very valuable

to those concerned with designing small work groups in medical school (e.g. laboratory), when the desire is to obtain groups with a most effective composition for accomplishing group tasks. Additional research is needed to determine if the relationship reported here exist under different circumstances and at different medical schools.

REFERENCES

1. Woodward, C.A. Measuring Learning Climate at McMaster: Conceptualization, Outcome and Challenge. Proceedings: Nineteenth Annual Conference on Research in Medical Education. Washington, D.C., 378-379, 1980.

2. Harris, A. Evaluation of a Medical School Learning Environment. Proceedings: Nineteenth Annual Conference on Research in Medical Education. Washington, D.C., 169-174, 1980.

3. Edwards, M.T. and Zimet, C.N. Problems and Concerns Amoung Medical Students. Journal of Medical Education. 51:619-625, 1976.

4. Royer, J.A., Huebner, L. and Cardes, D.L. Medical School Environmental Assessment. Proceedings: Seventeenth Annual Conference on Research in Medical Education. New Orleans, Louisiana, 389-391, 1978.

5. Marshall, R.K. The Impact of the Medical School Learning Environment on Academic Performance. Proceedings: Seventeenth Annual Conference on Research in Medical Education. New Orleans, Louisiana, 394-395, 1978.

6. Marshall, R.E. Measuring the Medical School Learning Environment. Journal of Medical Education. 53:98-104, 1978.

7. Feletti, G.I. and Clarke, R.M. Review of Psychometric Features of the Medical School Learning Environment Survey. Medical Education. 15:92-96, 1981.

8. Knoke, D. and Burt, R.S. Prominence. In Applied Network Analysis. R.S. Burt and M.J. Minor (Eds). Beverly Hills: Sage, pp. 195-222, 1983.

9. Lin, Nan. Social Resources and Instrumental Action. In Social Structure and Network Analysis. P.V. Marsden and Nan Lin (Ed). Beverly Hills: Sage, pp. 131-146, 1982.

10. Stern, L.W., Craig, C.S., LaGreca, A.J., and Salem, R.G. The Effect of Sociometric Location on the Adoption of an Innovation Within a University Faculty. Sociology of Education. 49:90-96, 1976.

11. Hurt, H.T. and Preiss, R. Silence Isn't Necessarily Golden: Communication Apprehension, Desired Social Choice, and Academic Success Among Middle-School Student. Human Communication Research. 4:315-328, 1978.

12. Knoke D. and Kuklinski, J.H. Network Analysis. Sage Univeristy Papger Series on Quantitative Applications in the Social Sciences, series 07-028. Beverly Hills: Sage, 1982.

13. Heist, P. and Yonge, G. Omnibus Personality Inventory. New York: The Psychological Corporation, 1968.

14. Myers, I.B. The Myers-Briggs Type Indicator. Palo Alto: Consulting Psychologists Press, 1962.

15. Daniel, C. and Wood, F.S. Fitting Equations to Data. New York: John Wiley and Sons, 1980.